

# IT34-4 “Impact Probabilities for a Constellation above 1000km”

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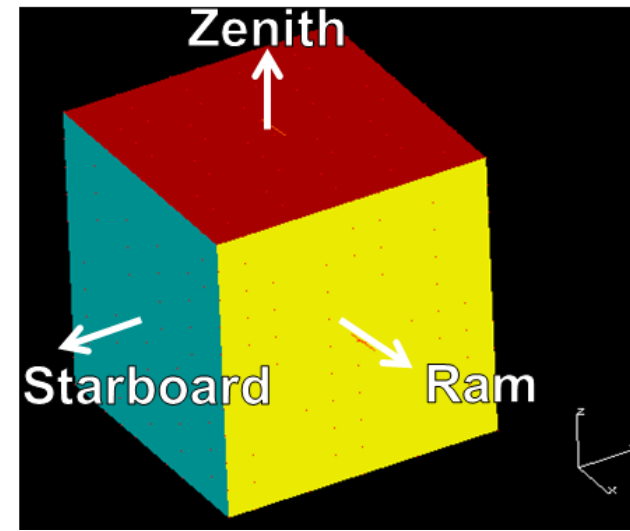
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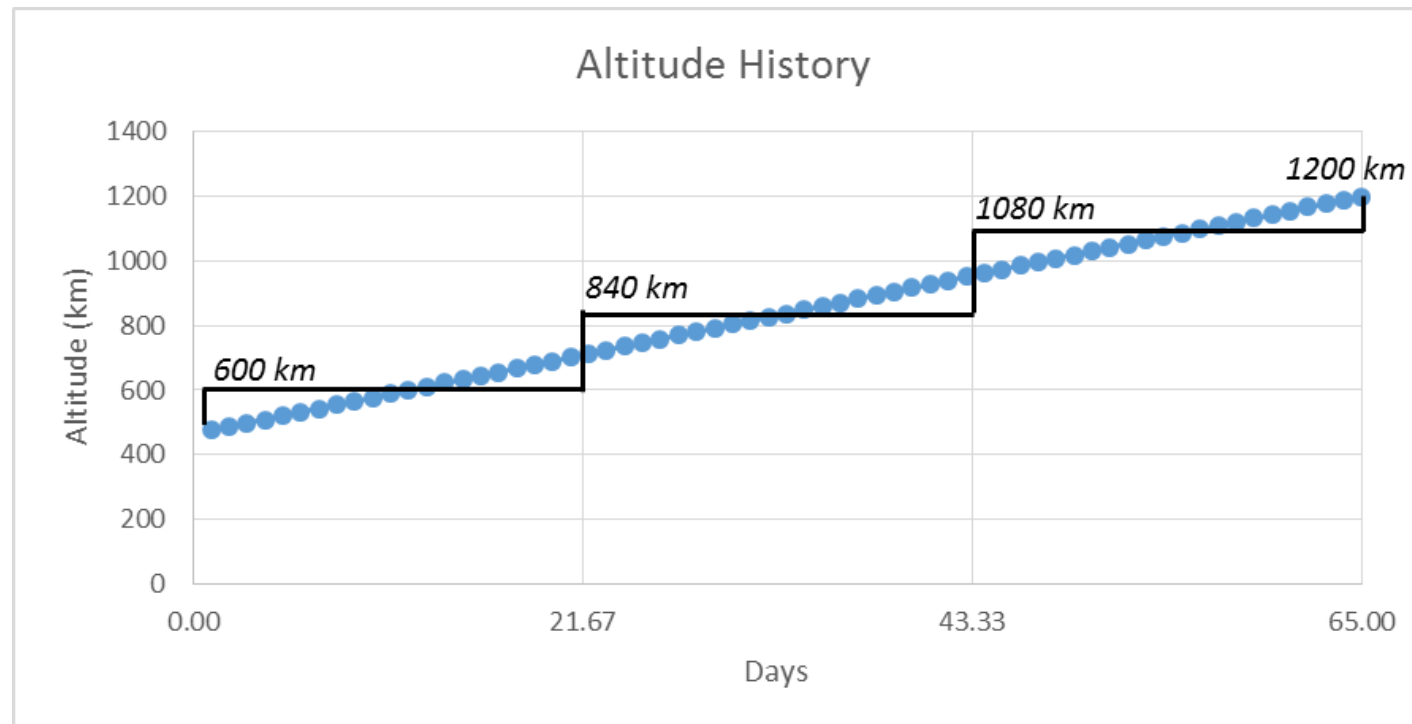
# Problem Statement

- Spacecraft geometry: 1x1x1m cube
- Spacecraft attitude: fixed in LVLH
- Constellation size: 720
- Twelve Year Life
  - Launch = 2018 – 2019
  - Operation = 2020 – 2024 (1200 km)
  - Disposal = 2025 – 2029
- Risk Assessment code: Bumper 3
- Environment: ORDEM 3.0, inclination =  $87.9^\circ$
- Failure criteria: catastrophic break up at 40KJ/kg, 150 kg spacecraft mass (Kinetic Energy > 6 MJ)



# Launch Phase

- Exposure Time 2018 – 2019 (360 spacecraft per year)
- Insert at 475km, with 65 day transit to 1200 km
- Circular orbits at 600,840 & 1080 km for 21.67 days each



# Disposal Phase

- Perigee of all members reduced by 200 km per year
- 2025 = 1200 x 1000 km
- 2026 = 1200 x 800 km
- 2027 = 1200 x 600 km
- 2028 = 1200 x 400 km
- 2029 = 1200 x 200 km



# Results

- Expected number of catastrophic collisions =  $7.47\text{E-}02$ , Odds = 1 in 14

